

1 JENNER & BLOCK LLP
2 Reid J. Schar (*pro hac vice*)
3 RSchar@jenner.com
353 N. Clark Street
Chicago, IL 60654-3456
4 Telephone: +1 312 222 9350
Facsimile: +1 312 527 0484

5 CLARENCE DYER & COHEN LLP
6 Kate Dyer (Bar No. 171891)
7 kdyer@clarencedyer.com
8 899 Ellis Street
San Francisco, CA 94109-7807
Telephone: +1 415 749 1800
9 Facsimile: +1 415 749 1694

10 CRAVATH, SWAINE & MOORE LLP
11 Kevin J. Orsini (*pro hac vice*)
korsini@cravath.com
12 825 Eighth Avenue
New York, NY 10019
13 Telephone: +1 212 474 1000
Facsimile: +1 212 474 3700

14
15 Attorneys for Defendant PACIFIC GAS AND ELECTRIC
COMPANY

16
17 UNITED STATES DISTRICT COURT
18 NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

19 UNITED STATES OF AMERICA,

Case No. 14-CR-00175-WHA

20 Plaintiff,

**RESPONSE TO COURT REQUEST
FOR AMENDED RESPONSES AND
FURTHER QUESTIONS TO BE
ANSWERED BY PG&E**

21 v.

22 PACIFIC GAS AND ELECTRIC COMPANY,

Judge: Hon. William Alsup

23 Defendant.
24
25

1 Defendant Pacific Gas and Electric Company (“PG&E”) respectfully submits this
2 response to the Court’s February 4, 2020 Request for Amended Responses and Further Questions
3 to be Answered by PG&E. (Dkt. 1136.)

4 **Follow-Up Questions to Docket No. 1111, Question 4**

5 **Question 1:** Regarding the July 2019 “ground” inspection, who was the
6 inspector? Give the name and contact information. The name and contact
7 information may be filed under seal for now, if PG&E requests. The Court,
8 however, may require him or her to testify.

9 **PG&E Response:**

10 PG&E understands this question to be referring to the detailed ground inspection
11 of Tower 001/006 on the Geysers #9-Lakeville 230 kV Transmission Line (the “Geysers #9
12 Line”) that PG&E performed on July 18, 2019. PG&E is filing under seal Exhibit A, which
13 includes the name of and contact information for the troubleman who performed that inspection.

14 **Question 2:** As a ground inspection, how close to the jumper cable did the
15 inspector get?

16 **PG&E Response:**

17 PG&E understands that the PG&E troubleman who performed the July 18, 2019
18 ground inspection of Tower 001/006 stood at ground level and visually observed the tower
19 components from that vantage point, possibly using binoculars. Based on Light Imaging and
20 Ranging (“LiDAR”) data, PG&E estimates that the jumper cable on the topmost phase of the
21 Geysers #9 Line was approximately 80 feet above the ground. As described in PG&E’s
22 responses to Questions 3, 9, 11, 14 and 18 below, Tower 001/006 was also subject to separate
23 climbing and drone inspections in February and May 2019, respectively.

1 **Question 3:** How could it be a “detailed” inspection if he or she stayed on the
 2 ground?

3 **PG&E Response:**

4 As defined in PG&E’s Electric Transmission Preventive Maintenance (“ETPM”)
 5 Manual in effect at the time of the July 18, 2019 ground inspection of Tower 001/006, a
 6 “detailed overhead inspection” is one during which “[i]ndividual elements and components are
 7 examined carefully through visual and/or routine diagnostic tests, and each abnormal condition is
 8 graded and/or recorded”. That version of PG&E’s ETPM Manual provides that a detailed
 9 inspection may take the form of a “ground, aerial, or climbing inspection”. When done by
 10 ground, inspectors typically use binoculars. The ETPM Manual provides for detailed ground
 11 inspections of 230 kV transmission lines every five years. In years during which a detailed
 12 inspection was not performed, 230 kV transmission lines were patrolled, typically by helicopter.¹

13 The July 18, 2019 ground inspection of Tower 001/006 was conducted pursuant
 14 to this schedule of ground inspections of 230 kV lines in PG&E’s system every five years. In
 15 2019, in addition to the routine inspections performed by PG&E employees, PG&E performed
 16 accelerated inspections of all transmission towers and poles in areas at higher risk of wildfire (as
 17 well as distribution facilities and substations in such areas) using enhanced technology and
 18 processes. Under that program, known as the Wildfire Safety Inspection Program (“WSIP”),

19
 20 ¹ Consistent with the Transmission Control Agreement (“TCA”) between PG&E and the
 21 California Independent System Operator (“CAISO”), PG&E submits summaries of the
 22 inspection and patrol procedures set forth in its ETPM Manual to CAISO for its review and
 23 adoption. See TCA § 2.2 & Appendix C §§ 2.3, 5.2.1.1, 5.3; Transmission Maintenance
 24 Procedure No. 7 § 7.3.2. Those summaries are contained in PG&E’s Transmission Owner
 25 Maintenance Practices document for Electrical Overhead Transmission Lines (“TOMP”). Since
 26 1997, CAISO has reviewed and adopted successive versions of PG&E’s TOMP.

27 In addition, CAISO may inspect PG&E facilities at any time on reasonable notice to verify
 28 inspection and maintenance performance. See TCA § 18.3; Transmission Maintenance
 29 Procedure No. 4 § 4.1.1. In a report on PG&E’s maintenance practices, issued on October 23,
 30 2018, CAISO reported that “site visits of overhead transmission lines indicated the lines were
 31 generally well maintained and largely reflected PG&E’s maintenance records.”

1 PG&E hired contractors to perform climbing inspections (during which inspectors climb towers)
2 and drone inspections (involving drones and helicopters equipped with high-resolution cameras
3 that fly around the structure) of all transmission towers in Tier 2 and Tier 3 High Fire-Threat
4 District (“HFTD”) areas prior to the 2019 fire season. Based on its location in a Tier 3 HFTD
5 area, the Geysers #9 Line was one of the more than 500 lines within the scope of PG&E’s WSIP
6 and, as a result, Tower 001/006 was subject to separate climbing and drone inspections in
7 February and May 2019, respectively. Those enhanced inspections were in addition to the
8 routine ground inspection of Tower 001/006 that PG&E performed on July 18, 2019, in
9 accordance with its existing practice of inspecting 230 kV lines from the ground every five years
10 and patrolling by helicopter in other years.

11 PG&E’s plan for inspections in 2020 and beyond is described in its latest Wildfire
12 Mitigation Plan that was recently submitted to the CPUC for review. As described in that Plan,
13 PG&E’s inspection program for transmission lines is moving from a prescriptive time cycle
14 frequency to an approach driven by risk, with the highest-risk assets requiring more frequent
15 inspections than lower-risk assets. In addition, the detailed inspection checklist for electric
16 transmission lines and equipment has been updated to incorporate WSIP-identified fire risk
17 considerations as well as baseline compliance guidelines. Detailed ground or climbing
18 inspections of electric transmission lines will be coupled with aerial inspection methods to
19 provide the additional aloft vantage points for each structure assessed during a given cycle.

20 **Question 4:** Did the inspector take photographs of the jumper cable? If so,
21 provide them.

22 **PG&E Response:**

23 The PG&E troubleman who performed the July 18, 2019 ground inspection of
24 Tower 001/006 did not take any photographs of the jumper cable.

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1 **Question 5:** What specifically did the inspector do to ascertain whether the
2 jumper cable remained secure, as opposed to on the verge of detaching?

3 **PG&E Response:**

4 The PG&E troubleman who performed the July 18, 2019 ground inspection of
5 Tower 001/006 stood on the ground and, from that vantage point, visually examined the structure
6 and its individual components (possibly using binoculars) for any abnormalities as defined in
7 PG&E's ETPM Manual, such as signs of arcing on the jumper, broken strands, rust, cracks,
8 gunshot damage, corrosion, twisting, loose or broken connectors, damaged or missing dampers,
9 and insufficient clearance from the tower or other components. The troubleman recorded no
10 such findings.

11 **Questions 6 and 7:** Did the checklist used by the inspector specifically inquire
12 into the conditions of the jumper cable? And, if so, what specifically was the
13 inspector supposed to check?

14 **PG&E Response:**

15 The inspection form used by the PG&E troubleman who performed the July 18,
16 2019 ground inspection of Tower 001/006 did not specifically inquire into the conditions of
17 jumper cables on the tower. PG&E notes that the electronic checklists that inspection personnel
18 used to record WSIP enhanced climbing and drone inspections of Tower 001/006 in February
19 and May 2019, respectively, did specifically inquire into the condition of individual transmission
20 line components and hardware, including jumper cables. Those inspections are described in
21 PG&E's responses to Questions 9, 11, 14, 15, 16 and 18 below.

22 **Question 8:** Explain the specific causes of the detachment in October, and why
23 those conditions weren't identified in the July inspection.

24 **PG&E Response:**

25 PG&E does not currently know what caused the detachment. CAL FIRE has
26 collected the jumper, and PG&E understands that CAL FIRE's investigation is ongoing. PG&E
27 does have access to certain photographs that were taken prior to the removal of the potential

1 evidence by CAL FIRE, but review of those photographs is insufficient to establish the cause of
2 the separation.²

3 **Question 9:** Regarding the February 2019 “climbing” inspection, who was the
4 inspector? Again, the name and contact information may be filed under seal for
5 now if PG&E requests.

6 **PG&E Response:**

7 PG&E understands this question to be referring to the climbing inspection of
8 Tower 001/006 on the Geysers #9 Line that a three-person PG&E contractor crew performed on
9 February 6, 2019, in connection with PG&E’s Wildfire Safety Inspection Program. PG&E
10 understands that two of the crew members climbed Tower 001/006 while the other remained on
11 the ground to inspect the tower from that vantage point and to record inspection findings on an
12 electronic checklist. PG&E is filing under seal Exhibit A, which lists the names of and contact
13 information for the three crew members.³

14 **Question 10:** What contractor was hired for the job?

15 **PG&E Response:**

16 The three-person contract inspection crew that performed the February 6, 2019
17 climbing inspection of Tower 001/006 was affiliated with Quanta Energy Services, LLC.

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² On October 26, 2019, PG&E employees and contractors took drone and other photographs
20 and video of Tower 001/006 to obtain footage of the condition of the tower, including the
21 detached jumper. After the drone footage was taken, CAL FIRE personnel directed the PG&E
22 personnel and contractors to provide the drone footage to CAL FIRE. The PG&E personnel and
23 contractors did so. PG&E subsequently learned from its contractor that images from the drone
24 footage of Tower 001/006 were cached on a computer and promptly informed CAL FIRE. CAL
25 FIRE has requested that PG&E not utilize or disseminate, outside of PG&E, the drone footage
26 of Tower 001/006, and PG&E has complied with that instruction. Further, the CPUC has
27 provided PG&E information about its observations of the collected equipment, but this
information also does not permit PG&E to establish the cause of the separation.

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³ PG&E understands that, in addition to the three members of the climbing inspection crew
who are identified on the climbing inspection form and are listed in Exhibit A, two contractor
groundmen were also present for the inspection, but that these groundmen did not climb the
tower.

1 **Question 11:** As a “climbing” inspection, how close to the jumper cable did the
2 inspector climb?

3 **PG&E Response:**

4 The two members of the contract inspection crew who climbed Tower 001/006 on
5 February 6, 2019 would have used a ladder built into the steel lattice to ascend the tower and
6 observe individual components more closely than they could from the ground. While PG&E
7 does not have records that note how close the inspectors climbed to the jumper, the ladder
8 allowed the climbers to reach a point on the tower that is approximately 20 feet from the jumper
9 cable that failed, as determined from LiDAR data.

10 **Question 12:** Was the line energized?

11 **PG&E Response:**

12 Yes, the Geysers #9 Line was energized at the time of the February 6, 2019
13 climbing inspection.

14 **Question 13:** Did the inspector touch and/or tug on the jumper cable?

15 **PG&E Response:**

16 No, the inspectors who performed the February 6, 2019 climbing inspection did
17 not touch or tug on the jumper cable.

18 **Question 14:** Did the inspector take photographs of the jumper cable? If so,
19 please provide them.

20 **PG&E Response:**

21 The inspectors who performed the February 6, 2019 climbing inspection took
22 multiple photographs of Tower 001/006 while aloft the tower, including of the ends of the
23 insulator strings on the tower. Two photographs in the completed inspection form show sections
24 of the jumper cable at issue. PG&E is attaching those photographs as Exhibit B to this

1 submission.⁴ One of the two photographs (the first in Exhibit B) captures the section of
2 conductor that later separated.

3 **Questions 15 and 16:** What did the inspector do to ascertain whether the jumper
4 cable remained secure, as opposed to on the verge of detaching? What
5 specifically was the inspector supposed to check to ensure that the jumper cable
6 was not in poor condition?

7 **PG&E Response:**

8 Consistent with the ETPM Manual in effect at the time of the inspection, PG&E
9 understands that the inspection crew would have examined the jumper cable for any
10 abnormalities as defined in the ETPM Manual, including signs of arcing, broken strands, rust,
11 cracks, gunshot damage, corrosion, twisting, loose or broken connectors, damaged or missing
12 dampers, and insufficient clearance from the tower or other components. In addition, the
13 inspectors were required by prompts in the electronic checklist used to record the inspection to
14 specifically consider whether the jumpers were “in poor condition” or had a “clearance issue”.
15 The inspectors answered “no” in response to each of these prompts.

16 **Question 17:** Explain why the February inspection did not discover the defects
17 that led to the separation in October.

18 **PG&E Response:**

19 As explained in PG&E’s response to Question 8 above, at this time, PG&E has
20 not determined the specific cause or causes of the jumper detachment on Tower 001/006 that was
21 observed in October 2019.

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27 ⁴ The crew members took other photographs of the structure as a whole, some of which also
capture the jumper cable, but from a farther distance.

1 **Question 18:** With respect to the May drone inspection, from the provided
2 photographs the tower appears far enough away that it would be impossible to
3 detect all but the most obvious problems, such as a jumper cable that has already
4 been well separated. Explain the purpose of the drone inspection, and how that
5 could have possibly been expected to reveal the defects that led to the October
6 detachment.

7 **PG&E Response:**

8 PG&E has not previously provided photographs of the May 2019 drone
9 inspection to the Court and is not aware of the particular photographs to which the Court is
10 referring. The drones that PG&E used to perform WSIP inspections of transmission towers are
11 equipped with cameras that take high-resolution photographs. The drones are able to reach
12 proximities and viewing angles that ground inspectors cannot, and inspectors examining the
13 photographs are able to zoom in on specific components to better observe their condition.
14 During the May 11, 2019 drone flight of Tower 001/006, the drone operator took 67 high-
15 resolution photographs of the tower from multiple vantage points, including a number of
16 photographs that capture the jumper cable and surrounding components. Attached as Exhibit C
17 to this submission are two photographs that show the jumper cable at issue, as well as two
18 blown-up portions of those same photographs that show the area of separation.

19 As explained in PG&E’s response to Question 3, drone inspections were one
20 component of PG&E’s enhanced inspections for 2019 of transmission towers in areas at higher
21 wildfire risk. In 2019, PG&E used drones with high-definition cameras to take photographs of
22 transmission towers in Tier 2 and Tier 3 HFTD areas from multiple vantage points. Those
23 photographs were then reviewed by an inspector on PG&E’s Drone Inspection Review Team
24 (“DIRT”). As further explained above, PG&E’s drone inspections are able to photograph tower
25 components, and those photographs can be reviewed for conditions requiring maintenance, such
26 as signs of arcing, broken strands, rust, cracks, gunshot damage, corrosion, twisting, loose or

1 broken connectors, damaged or missing dampers, and insufficient clearance from the tower or
2 other components.

3 As explained in PG&E's responses above, PG&E does not currently know the
4 cause of the jumper detachment observed in October 2019. PG&E notes that photographs of the
5 jumper cable taken during the May 11, 2019 drone inspection, attached as Exhibit C to this
6 submission, show the jumper cable to be intact.

7 **Question 19:** Explain why the inspectors used the incorrect form.

8 **PG&E Response:**

9 PG&E understands that the DIRT inspector used an incorrect form to document
10 the May 2019 drone inspection of Tower 001/006 (one for non-steel rather than steel structures)
11 because of human error. As noted in PG&E's prior filing, both forms included the same prompt
12 requiring DIRT to evaluate the condition of jumper cables on Tower 001/006.

13 **Follow-Up Questions to Docket No. 1111, Question 5:**

14 **Question 1:** PGE did not fully answer Question 5. Shouldn't we be concerned
15 that the inspections conducted by PG&E failed to detect the potential detachment
16 on the tower in question, and shouldn't we be concerned that other inspections of
17 other towers using the same protocol have also failed to catch jumper cables on
18 the verge of detachment?

19 **PG&E Response:**

20 It is certainly a matter of significant concern to PG&E that the jumper cable on
21 Tower 001/006 separated. That separation occurred after Tower 001/006 was inspected three
22 times in 2019 by different personnel using three different inspection methods. As noted, PG&E
23 does not currently know why or when the jumper detached, and PG&E understands that CAL
24 FIRE, which has possession of the relevant equipment, is continuing its investigation. Once the
25 cause of the detachment is determined, PG&E expects that will help PG&E ascertain what
26 concerns, if any, that may raise for other towers and the actions, if any, that are needed to address
27 those concerns.

1 **Question 2:** What good are inspections that don't find problems?

2 **PG&E Response:**

3 Inspections, including the enhanced inspections that PG&E implemented after the
4 2018 Camp Fire, are designed to detect existing and emergent problems. Since the
5 implementation of WSIP in December 2018, PG&E has completed enhanced inspections of
6 approximately 700,000 distribution structures across 25,000 miles and approximately 50,000
7 transmission structures over more than 5,500 miles. As of October 31, 2019, PG&E identified
8 approximately 8,900 high-priority conditions (*i.e.*, conditions requiring repair immediately or
9 within three months) on distribution lines and approximately 8,500 high-priority conditions on
10 transmission lines, in addition to approximately 180,400 lower-priority conditions on distribution
11 lines and approximately 92,400 lower-priority conditions on transmission lines.

12 **Follow-Up Question to Docket No. 1125**

13 **Question 1:** With respect to the Camp Fire, PG&E was asked what is possible,
14 not what they believe. Please explain plausible scenarios in which the failure of
15 the hold-down anchor contributed to the failure of the C-hook, taking into
16 consideration how the listed components and others (the insulator, jumper cables,
17 links, etc.) all affected each other as a system.

18 **PG&E Response:**

19 PG&E is not aware of any plausible scenarios in which the failure of the hold-
20 down anchor at Tower :27/221 on the Caribou-Palermo 115 kV Transmission Line (the
21 “Caribou-Palermo Line”) contributed in a non-negligible way to the failure of the C-hook on
22 Tower :27/222.

23 **Question 2:** Did the C-hook that failed in any way interrelate with the anchor?

24 **PG&E Response:**

25 Yes, the C-hook that failed interrelated in some way with the hold-down anchor,
26 but only in a highly attenuated way. The hold-down anchor held down a suspension insulator on
27 the right phase of Tower :27/221. That suspension insulator, in turn, supported the tensioned

1 C-phase conductor on the Caribou-Palermo Line, which extended approximately 850 feet to
2 Tower :27/222. At Tower :27/222, the C-phase conductor terminated at a clamp on the hot end
3 of two “dead-end” insulators. From the other end of that clamp, the C-phase conductor was
4 transposed to the left-phase position on the other side of Tower :27/222 by means of a
5 transposition jumper, a physically distinct piece of conductor. The transposition jumper that
6 joined the two conductors was supported by two suspension insulators attached to the runner
7 arms of Tower :27/222. The C-hook that failed held up the suspension insulator on the left-
8 phase runner arm—*i.e.*, the arm that was farthest away from the C-phase conductor extending
9 from Tower :27/221.

10 **Question 3:** Did the C-hook on Tower :27/222 and the hold-down anchor on
11 Tower :27/221 share the same conductor line?

12 **PG&E Response:**

13 No, the C-hook on Tower :27/222 and the hold-down anchor on Tower :27/221
14 did not share the same conductor line. The C-hook on Tower :27/222 that failed held up a
15 suspension insulator that supported a non-tensioned transposition jumper. That transposition
16 jumper was used to transpose the C-phase conductor that ran between :27/221 and :27/222 (a
17 physically distinct piece of conductor from the jumper) from the right-phase position on the span
18 between Tower :27/221 and Tower :27/222 to the left-phase position on the span between
19 Tower :27/222 and Tower :27/223. The hold-down anchor at Tower :27/221 held down an
20 insulator that supported the C-phase conductor.

21 **Question 4:** Provide a diagram that shows the hold-down anchor, the C-hook that
22 failed, and other relevant components.

23 **PG&E Response:**

24 Attached as Exhibit D is an annotated diagram showing the hold-down anchor on
25 Tower :27/221, the C-hook on Tower :27/222 that failed, and other relevant components.
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1 **Follow-Up Question to Docket No. 1125, Question 10:**

2 **Question 1:** PGE did not fully answer Question 10, specifically the extent to
3 which they knew about C-hook wear prior to the Camp Fire. With respect to how
4 “PG&E personnel noted that metal-on-metal rubbing caused or exacerbated by
5 wind conditions could result in wear of C-hooks and hanger plates,” what form
6 did this notation take? Please provide them.

7 **PG&E Response:**

8 PG&E’s statement that “PG&E personnel noted that metal-on-metal rubbing
9 caused or exacerbated by wind conditions could result in wear of C-hooks and hanger plates”
10 was based on the 12 instances cataloged for the Court in PG&E’s December 19, 2019 Response
11 to Follow-up Questions Regarding CPUC Report on Camp Fire, Further Questions to be
12 Answered by PG&E by December 19 and Supplemental Question 6a (the “December 19, 2019
13 Responses”). For each of the 12 instances described in that submission, PG&E is providing in
14 Exhibit E one document, such as a testing report, maintenance notification or email, in which
15 PG&E personnel noted or discussed the C-hook or hanger plate wear at issue. There is typically
16 more than one report, notification or email relating to each instance, and PG&E can provide
17 those additional documents upon request. As stated in PG&E’s December 19, 2019 Responses,
18 PG&E believes that prior to the Camp Fire, the occasions on which PG&E records noted wear on
19 C-hooks or working eyes were limited in the context of the overall number of such components
20 in PG&E’s system, and PG&E followed up on identified issues. (Dkt. 1128 at 10-11.)

21 **Question 2:** Were these notes taken prior to the Camp Fire?

22 **PG&E Response:**

23 Yes.

24 **Question 3:** The Exponent report concludes that “factors such as design (link
25 connectors and relatively large number of non-tensioned insulated connectors),
26 long duration exposure to higher winds, age, and historical inspection
27 methodologies likely contributed to these [increased rates of] cold end hardware

1 issues" (Exponent Report on PG&E Caribou-Palermo Asset Condition
2 Investigation, vi). PG&E must clarify what it knew with respect to these various
3 factors prior to the Camp Fire. Regarding component design, was PG&E aware
4 that Caribou-Palermo towers used significantly lower weight conductors than
5 non-adjacent comparison lines (Exponent Report, 61)?

6 **PG&E Response:**

7 PG&E was aware prior to the Camp Fire that different sections of the Caribou-
8 Palermo Line used different types of conductors, and that some of those conductor types were of
9 significantly lower weight than those used on other transmission lines in PG&E's system. In
10 particular, PG&E was aware that most of the Caribou-Palermo Line (36.8 miles) used 452.3
11 kcmil aluminum conductor steel-reinforced ("ACSR"), that a large section on the southern end of
12 the line (13.2 miles) used 167.8 kcmil copper conductor, that two short sections of the line (2.2
13 miles and 1.5 miles) used 397.5 kcmil or 715.5 kcmil all-aluminum conductor ("AAC"), and that
14 two short line sections (0.9 miles and 0.6 miles) used 397.5 kcmil ACSR or 795 kcmil ACSR.
15 The 452.3 kcmil ACSR conductor used on most of the Caribou-Palermo Line, including the
16 spans on either side of Tower :27/222, is neither the heaviest nor the lightest type of conductor in
17 use in PG&E's system.

18 **Question 4:** Was PG&E aware that lower span weights might increase
19 susceptibility to wind-induced conductor sway, and thus wear?

20 **PG&E Response:**

21 Prior to the Camp Fire, PG&E engineers understood that lower span weight could
22 increase susceptibility to wind-induced conductor sway, and thus wear. At this time, PG&E has
23 not identified information establishing that it was aware prior to the Camp Fire that lower
24 conductor weight was a significant contributor to wear on cold-end insulator attachment
25 hardware.

1 **Question 5:** Was PG&E aware of the high correlation between non-tensioned
2 insulated jumpers and cold-end hardware wear (Exponent Report, 75)?

3 **PG&E Response:**

4 Prior to the Camp Fire, PG&E engineers understood that non-tensioned insulated
5 jumpers were more prone to wind sway, and thus wear, than conductors under tension. At this
6 time, PG&E has not identified information establishing that prior to the Exponent Report it had
7 analyzed the correlation, if any, between the presence of non-tensioned insulated jumpers and
8 wear on cold-end insulator attachment hardware.

9 **Questions 6 and 7:** Regarding wind conditions, was PG&E aware that the
10 Caribou-Palermo line experienced higher than average Aeolian conditions (low,
11 sustained wind speeds)? Was PG&E aware that these conditions were known to
12 cause hardware fatigue or wear damage over time in towers? (Exponent Report,
13 57)?

14 **PG&E Response:**

15 Prior to the Camp Fire, PG&E was aware that the sustained effects of wind could
16 cause wear on tower hardware over time. (*See, e.g.*, Exhibit F (August 2009 email chain among
17 PG&E engineers and transmission line personnel that includes discussion of the influence of
18 Aeolian vibration, galloping, insulator and conductor movement, and wind more generally on
19 transmission line components).) At this time, PG&E has not identified information establishing
20 that prior to the Exponent Report it was aware that the Caribou-Palermo Line experienced
21 higher-than-average Aeolian conditions as compared with the other lines analyzed by Exponent.

22 **Questions 8-9:** Was PG&E aware that the Caribou-Palermo line experienced
23 double the amount of galloping winds of next closest lines (relatively high wind

1 speeds)? Was PG&E aware that these higher sustained winds were more likely to
 2 cause motion in non-tensioned lines and hardware (Exponent Report, 57)?

3 **PG&E Response:**

4 At this time, PG&E has not identified information establishing that it was aware
 5 prior to the Camp Fire that the Caribou-Palermo Line experienced double the amount of
 6 galloping winds as compared with the Bucks Creek-Rock Creek-Cresta and Pit #4 Tap lines.
 7 Prior to the Camp Fire, PG&E was aware that high windspeeds could cause wear on tower
 8 hardware over time and motion in non-tensioned lines and hardware.

9 **Question 10:** Regarding the age of components, how old were the C-hooks on
 10 the Caribou-Palermo line?

11 **PG&E Response:**

12 PG&E does not know the ages of the large number of C-hooks on the hundreds of
 13 structures that make up the Caribou-Palermo Line. For any of the numerous individual C-hooks
 14 on the Caribou-Palermo Line, PG&E can attempt to deduce the date that particular C-hook was
 15 installed by referencing any physical markings on the C-hook, historical design drawings,
 16 manufacturer catalogs and work orders. For various reasons, however, the available information
 17 for each individual C-hook may be inconclusive or insufficient to allow PG&E to determine the
 18 installation date of that hook. For example, work orders relating to the replacement of
 19 attachment hardware on the Caribou-Palermo Line that occurred several decades ago may be
 20 archived in hard copy or no longer be available, consistent with applicable record retention
 21 periods. *See* CPUC General Order 95, Section I, Rule 18(A)(1) (requiring that “corrective
 22 action” records “be preserved by the company for at least ten (10) years and . . . be made
 23 available to Commission staff upon 30 days notice”); 18 C.F.R. §§ 125.1-125.3 (regulations
 24 promulgated by the Federal Energy Regulatory Commission (“FERC”) prescribing a five-year
 25 retention period for “maintenance work orders and job orders” for transmission and distribution
 26 facilities owned by public utilities subject to FERC’s jurisdiction).

1 **Question 11:** PG&E previously stated that the non-routine climbing investigation
2 of Caribou-Palermo the month of the Camp Fire was related to the age of the line
3 (CAMP-0676). Did PG&E know that older towers might be more at risk of cold-
4 end hardware wear?

5 **PG&E Response:**

6 PG&E was aware before the Camp Fire that cold-end hardware, like many
7 transmission line components, wears at least to some degree with age. PG&E was also aware
8 that age is but one of a number of factors that influence wear and the overall condition of cold-
9 end hardware and other tower components.

10 **Question 12:** Was that the primary factor in selecting Caribou-Palermo for a
11 non-routine climbing investigation?

12 **PG&E Response:**

13 PG&E's records do not enumerate the factors that led to the selection of multiple
14 lines in the North Valley region, including the Caribou-Palermo Line, for non-routine climbing
15 inspections in 2018. Based on its investigation, PG&E believes that age was one of the factors
16 that led to selection of the Caribou-Palermo Line for non-routine climbing, but has been unable
17 to determine the primacy or relative importance of that factor.

18 **Questions 13-14:** Further questions shall be answered about the nature of the
19 non-routine climbing inspection that occurred just before the Camp Fire, from
20 September 19, 2018 to November 5, 2018. There was an inspection of the
21 Caribou-Palermo line the month of the fire. It is obvious from the nature of the
22 C-hook gouging that this issue would have been visible to any inspector who got
23 close enough to see the condition of the C-hook. No high-priority tags associated
24 with cold-end hardware wear were found from January 2001 to October 2018
25 (Exponent Report, 68). The November 2018 non-routine inspection caught 141
26 issues along the Caribou-Palermo lines, but found zero cold-end hardware issues
27 (Exponent Report, 67). A post-fire inspection from November 8, 2018, to June

1 19, 2019, using new inspection procedures, caught 32 issues of high-priority wear
2 on cold-end hardware (Exponent Report, 40). What accounts for the fact that
3 there were 32 incidents of high-priority cold-end hardware wear discovered after
4 the disaster? Why were they not caught earlier? What were the new inspection
5 procedures?

6 **PG&E Response:**

7 The discovery of 32 instances of high-priority cold-end hardware wear on the
8 Caribou-Palermo Line was the result of PG&E's inspection efforts following the Camp Fire.
9 Those efforts included enhanced and accelerated inspections performed as part of PG&E's
10 Wildfire Safety Inspection Program. The new inspection procedures applicable to WSIP are
11 described in PG&E's response to Question 18. Prior to WSIP and as an immediate response to
12 the Camp Fire, PG&E performed expedited climbing inspections of structures on the Caribou-
13 Palermo Line in the days and weeks following the fire.

14 Before the Camp Fire, the Caribou-Palermo Line was last subject to a detailed
15 inspection in 2014, and certain towers were subject to non-routine climbing inspections in the
16 three months preceding the Camp Fire. PG&E cannot be certain why the 32 conditions that were
17 identified through inspections that occurred after the Camp Fire were not caught earlier. There
18 are numerous possible reasons. For example, certain conditions may have arisen or become
19 easier to identify since the last inspection, the inspection methods employed after the Camp Fire
20 may have provided a better vantage point for detecting the condition, or inspectors might have
21 scrutinized cold-end insulator hardware more closely in light of the cold-end hardware failure at
22 the origin of the Camp Fire.

23 **Question 16:** What accounts for the change in inspection procedures?

24 **PG&E Response:**

25 As a result of the Camp Fire and growing wildfire risk in its service territory,
26 PG&E implemented a number of new initiatives to further reduce wildfire risk in late 2018 and
27 2019.

1 **Question 17:** Why did the September 2018 revision of the detailed climbing
2 inspection form for non-500kV structures inquire into the condition of cold-end
3 hardware, whereas the older form did not (CAMP-0636; compared with CAMP-
4 0641)?

5 **PG&E Response:**

6 Both the September 2018 revision of the form designated TD-1001M-F04, Steel
7 Structure Detailed Climbing Inspection Form (Non-500 kV Structures), and the earlier revision
8 of that same form, designated TD-1001M-FXX and dated March 2016, inquired into the
9 condition of cold-end insulator attachment hardware. The second page of the revision dated
10 March 2016 prompts the inspector completing the form to check for the following condition:
11 “Working eyes and shackles free of wear.” The only material difference between the two forms
12 is that the September 2018 revision uses different language for the corresponding prompt, which
13 reads: “Working eyes and shackles show significant wear.” Blank copies of the March 2016
14 and September 2018 forms are attached to this submission as Exhibit G.

15 **Question 18:** What do new “enhanced” inspection procedures, including CIRT
16 and DIRT, require of inspectors to check for cold-end hardware wear?

17 **PG&E Response:**

18 PG&E’s enhanced WSIP inspections differed from its prior routine inspections in
19 various ways, including, for transmission towers in elevated and extreme high fire-threat areas,
20 the use of climbing and drones equipped with high-resolution cameras; inspection forms that
21 specifically required inspectors to check for certain potential failure modes (including worn cold-
22 end hardware) and document the condition of various components (including cold-end
23 hardware), regardless of whether they required repair; review of drone photographs by members
24 of the Drone Inspection Review Team; and review and prioritization of inspection findings by
25 CIRT, composed of personnel with collective experience in engineering, inspections and
26 maintenance. Of note, WSIP inspections were informed by a Failure Modes and Effects
27 Analysis (“FMEA”) that PG&E conducted after the Camp Fire. The FMEA identified multiple
28

1 potential points of failure on transmission assets that could cause ignitions, including wear on
 2 C-hooks and other insulator attachment hardware, and the failure points capable of visual
 3 observation were incorporated into WSIP inspection forms.

4 PG&E's WSIP inspections use electronic inspection forms, called "Pronto
 5 Forms", that require field and drone inspectors to respond to specific prompts regarding the
 6 condition of tower components, including cold-end insulator attachment hardware. Specifically,
 7 field inspectors performing climbing inspections must answer "Yes" or "No" to the following
 8 prompts that are intended to identify conditions on cold-end insulator attachment hardware:
 9 "Suspension/Dead-end conductor hardware cold-end in poor condition (e.g., C-hook)",
 10 "Insulator hanger (eye) plate in poor condition?", and "Working eyes and shackles show
 11 significant wear". In the event that an inspector answers "Yes" to any one of these prompts, a
 12 preliminary notification recording the condition is required to be created and is subject to further
 13 review by CIRT to assign the condition an appropriate priority level for repair in accordance
 14 with PG&E's ETPM Manual.

15 **Question 19:** What are the names and contact information of the inspectors who
 16 conducted the post-fire inspection? PG&E may request to keep the names under
 17 seal.

18 **PG&E Response:**

19 PG&E understands "the post-fire inspection" to mean climbing and drone
 20 inspections of Tower :27/222 on the Caribou-Palermo Line that were performed as part of the
 21 Wildfire Safety Inspection Program. The Caribou-Palermo Line has approximately 450
 22 structures, almost all of which were subject to both climbing and drone inspections in 2019 by
 23 various PG&E contract inspectors assigned to WSIP. PG&E is filing under seal Exhibit A,
 24 which identifies the names of and contact information for the PG&E contractors who performed
 25 the WSIP climbing and drone inspections of Tower :27/222 on January 22, 2019, and
 26 January 29, 2019, respectively. By the time these WSIP inspections took place, CAL FIRE had
 27 already collected evidence from Tower :27/222, including the two C-hooks and suspension

1 insulators previously attached to the runner arms and the transposition jumper that they
2 supported. Exhibit A does not include names of or contact information for the personnel who
3 operated the drones that took photographs of Tower :27/222 but played no other role in the
4 inspection process, the PG&E employees who performed non-WSIP inspections of the Caribou-
5 Palermo Line in the days and weeks following the Camp Fire, or the members of the Centralized
6 Inspection Review Team who reviewed findings by the primary WSIP inspectors.

7 **Question 20:** Were they contractors?

8 **PG&E Response:**

9 All accelerated and enhanced inspections conducted after the Camp Fire pursuant
10 to WSIP, including the WSIP inspections of the Caribou-Palermo Line, were performed by
11 contractors. Non-WSIP inspections of structures on the Caribou-Palermo Line in the days and
12 weeks following the Camp Fire were performed by PG&E employees.

13 **Question 21:** Was the line de-energized?

14 **PG&E Response:**

15 The Caribou-Palermo Line was de-energized at the time of the post-Camp Fire
16 inspections and has been de-energized since December 2018. For additional information
17 regarding the de-energization of the Caribou-Palermo Line, PG&E refers the Court to PG&E's
18 Supplemental Response to Request for Information dated August 16, 2019. (Dkt. 1090.)

19 **Questions 22-25:** What specifically did the inspectors do to ascertain whether the
20 C-hooks remained in good condition? Did the post-fire climbing inspection form
21 inquire into the condition of cold-end hardware? If no, why not? And, if so, what
22 specifically was the inspector supposed to check?

23 **PG&E Response:**

24 Beginning in January 2019, PG&E commenced WSIP climbing and drone
25 inspections of the Caribou-Palermo Line, which remained de-energized. As noted above, all
26 transmission lines in elevated and extreme high fire-threat areas were within the WSIP scope for
27 2019. PG&E's response to Question 18 above describes the guidance given to the field

1 inspectors who performed these enhanced inspections and the electronic forms they used to
 2 record findings. As noted, those forms specifically inquired into the condition of cold-end
 3 insulator attachment hardware, including C-hooks.

4 Non-WSIP inspections of structures on the Caribou-Palermo Line were performed
 5 in the days and weeks following the Camp Fire. These were climbing inspections, findings from
 6 which were recorded on form TD-1001M-FXX, Steel Structure Detailed Climbing Inspection
 7 Form (Non-500 kV Structures). That form prompts the inspector completing the form to check
 8 for the following condition: “Working eyes and shackles free of wear.”

9 **Question 26:** There were three times more cold-end insulator high-priority
 10 incident tags along the Caribou-Palermo line caught post-fire than the next
 11 highest line (Exponent Report, 75). What accounts for this high incident rate?

12 **PG&E Response:**

13 In early 2019, the CPUC’s Safety and Enforcement Division directed PG&E to
 14 engage Exponent, an independent third-party engineering firm, to analyze why the Caribou-
 15 Palermo Line had a greater number of high-priority conditions than other transmission lines with
 16 similar characteristics. In its final report dated November 1, 2019, Exponent stated that
 17 “Caribou-Palermo and other North Fork Feather River Canyon lines appear to have a unique set
 18 of factors that contributed to increased rates of high-priority cold-end hardware tags relative to
 19 other comparison lines” and that “[f]actors such as design (link connectors and a relatively large
 20 number of non-tensioned insulated conductors), long-duration exposure to higher winds, age, and
 21 historical inspection methodologies likely all contributed to these cold-end hardware wear
 22 issues.” (Exponent Report at 76.) PG&E refers to the report for Exponent’s full findings.

23 **Question 27:** Append to your response the ten most pertinent emails, memos,
 24 text messages or other documents (including electronic documents) that show the
 25 true extent to which PG&E knew before the Camp Fire that C-hook wear was a

1 safety problem. Do NOT refer to large swaths of documents. PG&E must find
2 and append the ten (and only ten) most pertinent documents.

3 **PG&E Response:**

4 Question 27 asks about PG&E's knowledge prior to the Camp Fire, unbounded by
5 any date range, seniority level or area of responsibility of personnel, or other dimension. PG&E
6 is a large corporation with over 100 years of history. It has tens of thousands of employees and a
7 similarly large number of former employees, many of whom have passed away or relocated, as
8 well as an immense volume of corporate documents and records. In addition, PG&E's
9 knowledge does not reside with any one person but is distributed among many different
10 individuals with different roles and responsibilities. The answers in this submission about
11 PG&E's knowledge are given against that background and are based on a reasonable
12 investigation of the available information. PG&E further notes that there are no objective
13 criteria for identifying the 10 documents "most pertinent" to PG&E's knowledge of C-hook wear
14 before the Camp Fire. Identifying those documents requires a judgment call on which different
15 people could reasonably make different judgments.

16 Defining pertinency by reference to PG&E's awareness prior to the Camp Fire of
17 past instances of C-hook or hanger plate wear, PG&E refers the Court to the documents that are
18 already being provided in response to Question 1 above, attached as Exhibit E to this submission.
19 For the avoidance of doubt, PG&E is not representing that the documents being provided in
20 Exhibit E constitute all documents relating to its knowledge before the Camp Fire of C-hook or
21 hanger plate wear. Nor can PG&E represent that a different person would not identify a different
22 set of documents as the "most pertinent" documents.

23 **Follow-Up Question to Docket No. 1129, Question 1:**

24 **Questions 1-3:** Please provide more details on the extent that PG&E has fallen
25 short. Please explain why PG&E is now following a new patrol strategy that is

1 not approved by the CPUC. Please explain how this strategy differs from the
 2 CPUC-approved strategy.

3 **PG&E Response:**

4 The CPUC considered and approved PG&E's Amended Wildfire Safety Plan (the
 5 "Amended WSP"), submitted to the CPUC on February 14, 2019. On April 25, 2019, PG&E
 6 filed with the CPUC a Second Amended Wildfire Safety Plan (the "Second Amended WSP")
 7 notifying the CPUC of proposed changes to, among other things, its patrol strategy for re-
 8 energization of lines de-energized as a result of Public Safety Power Shutoff ("PSPS") events.
 9 The Amended WSP approved by the CPUC stated that, after a PSPS event, "[c]rews will patrol
 10 all facilities de-energized during a PSPS event to identify any damage that needs to be repaired
 11 before re-energizing." (Pacific Gas and Electric Company Amended Wildfire Safety Plan,
 12 February 6, 2019, at 109.) The Second Amended WSP updated this language to explain that
 13 PG&E would "[r]e-energize only when confirmed safe to do so and only after lines *within areas*
 14 *triggering the PSPS decision* are patrolled and clear of defects or damage." (Second
 15 Amendment to Pacific Gas and Electric Company's Wildfire Mitigation Plan, R.18-10-007,
 16 April 25, 2019, at 20-21 (emphasis added).) PG&E followed the re-energization strategy set
 17 forth in its Second Amended WSP for PSPS events in 2019.

18 Under the CPUC-approved strategy set forth in the Amended WSP and explained
 19 above, PG&E would have been required to patrol all lines de-energized as a result of a PSPS
 20 event, including lines in areas that did not experience PSPS-triggering conditions (collectively,
 21 the "PSPS footprint") but were nonetheless de-energized as a consequence of the decision to de-
 22 energize upstream transmission lines on which they rely for power. Under the updated strategy
 23 that PG&E submitted for CPUC approval in advance of the 2019 fire season, PG&E explained
 24 that it would exercise "operational judgment" in determining whether to patrol distribution lines
 25 in areas that did not experience the PSPS-triggering conditions but were interrupted only because
 26 of the de-energization of other lines that did experience such conditions.

PG&E refined its patrol strategy in this manner to account for the expanded scope of the PSPS program for 2019. As PG&E explained to the CPUC in its Second Amended WSP, the original language calling for patrol of all de-energized lines prior to re-energization was based on PG&E’s PSPS program as implemented in 2018. At that time, the PSPS scope did not include high-voltage transmission lines. Following the Camp Fire, PG&E expanded the scope of the PSPS program to include such lines. Because the electrical grid is interconnected, the de-energization of high-voltage transmission lines can have a cascading effect that causes other transmission and distribution lines—potentially far from the original fire-risk areas—to be de-energized. Thus, distribution lines far outside the high fire-risk areas that triggered the PSPS event, but that rely on the de-energized lines for power, such as lines in cities like San Francisco or San Jose, could be de-energized. Patrol of these lines that are outside the PSPS footprint and do not otherwise pose a high risk of wildfire would exacerbate the hardship caused by PSPS events by delaying restoration of power to large numbers of customers.

Question 4: Please explain in more detail how PG&E exercises “operational judgement” to determine whether to re-energize patrol lines.

PG&E Response:

The Second Amended WSP clarified that PG&E would “exercise operational judgment” in determining whether to patrol distribution lines in areas outside the PSPS footprint. For PSPS events in 2019, PG&E determined that it would patrol (i) all transmission lines that were de-energized because they traversed the PSPS footprint and were identified as meeting the criteria for proactive de-energization of transmission lines for the PSPS event; and (ii) all distribution lines in Tier 2 and Tier 3 HFTD areas that were de-energized during the event and fell within the PSPS footprint. Prior to re-energizing, PG&E did not patrol (i) segments of distribution lines not in Tier 2 or Tier 3 HFTD areas, whether within or outside the PSPS footprint; or (ii) distribution lines outside the PSPS footprint, regardless of HFTD area, that were

1 de-energized only as a consequence of de-energizing upstream transmission lines.⁵ In addition,
2 following PSPS events in 2019, PG&E did not patrol transmission lines within the PSPS
3 footprint that did not meet the standard for proactive de-energization and therefore remained
4 energized during the PSPS event.

5 PG&E exercised its operational judgment in this way to reduce hardship to
6 customers who were not in areas that experienced PSPS-triggering conditions but lost power
7 because of the downstream effects of de-energizing other lines within the PSPS footprint.
8 Distribution lines that fall outside the PSPS footprint do not share the same wind or fuel
9 conditions as those within it, and wind-related damage is thus both less likely to occur and less
10 likely to cause a wildfire where it does occur. Similarly, distribution lines that are not in Tier 2
11 or Tier 3 HFTD areas but happen to fall within the PSPS footprint do not present a heightened
12 wildfire risk. Given the lower wildfire risk posed by lines outside the PSPS footprint and lines
13 within the footprint but not in Tier 2 or Tier 3 HFTD areas, PG&E determined that patrolling
14 these lines prior to re-energizing was not required for safety and would delay restoration of
15 power to the affected customers. As a result, PG&E excluded these lines from its post-event
16 patrol strategy.

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25 ⁵ Following PSPS events in 2019, PG&E patrolled every mile of transmission lines that were
26 proactively de-energized (including line sections beyond the PSPS footprint) because the
27 additional time required to patrol such lines was minimal as compared with the time required to
patrol only the section traversing the PSPS footprint.

1 **Follow-Up Question to Docket No. 1135, Amended Response to Questions to PG&E re Late**
2 **October PSPS:**

3 **Question 1:** With respect to your January 29 amended response, please explain
4 by way of examples your use of the term “infrastructure damage,” giving
5 examples as to both distribution lines and transmission lines.

6 **PG&E Response:**

7 In PG&E’s January 29, 2020 and February 7, 2020 responses to the Court
8 regarding the October 26 and October 29 PSPS events, PG&E reported that it identified
9 approximately 102 instances of damage to its infrastructure that appear to have been caused by
10 extreme wind and/or other fire conditions present during the October 26 and October 29 PSPS
11 events. (Dkt. 1135; Dkt. 1139.) PG&E identified infrastructure damage only to distribution
12 lines during its patrols of the lines included in the October 26 and October 29 PSPS events.

13 PG&E is providing in Exhibit H photos of four instances of infrastructure damage
14 to its distribution lines that it identified during the October 26 and October 29 PSPS events.
15 Those photographs depict a pole in Contra Costa County that broke and fell over due to winds; a
16 down guy wire in Calaveras County that snapped due to stress on the pole from winds; a broken
17 tie wire in Santa Clara County that fastened a conductor to an insulator and appears to have
18 broken due to winds; and a crossarm in Nevada County that split down the middle due to stress
19 from winds.

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1 Dated: February 18, 2020

Respectfully Submitted,

2 JENNER & BLOCK LLP

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4 By: /s/ Reid J. Schar

5 Reid J. Schar (*pro hac vice*)

6 CRAVATH, SWAINE & MOORE LLP

7

8 By: /s/ Kevin J. Orsini

9 Kevin J. Orsini (*pro hac vice*)

10 CLARENCE DYER & COHEN LLP

11

12 By: /s/ Kate Dyer

13 Kate Dyer (Bar No. 171891)

14

15 Attorneys for Defendant PACIFIC GAS
16 AND ELECTRIC COMPANY

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